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UNIVERSITY OF SASKATCHEWAN
DEPARTMENT OF MATHEMATICS & STATISTICS
MATH. 224.3 (ALL SECTIONS)

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March 17, 2003 Midterm Examination #2 Time: 4:30-5:50

IMPORTANT

- Print your name and encode your student number on the multiple choice sheet.
- Open Book Examination: Students may use "Calculus" by J. Stewart.
- No Calculators or formula sheets are allowed.
- All questions are of equal value.

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1. Evaluate the limit of the sequence $\left\{\left(1-\frac{4}{n}\right)^n\right\}_{n=1}^{\infty}$.

   (A) e^0 (B) e^{-1} (C) e (D) e^{-2} (E) e^2 (F) e^{-3} (G) e^3 (H) e^{-4} (I) e^4 (J) e^{-5}

2. Evaluate the limit of the sequence

$$\sqrt[5]{9},\ \sqrt[5]{9\sqrt[5]{9}},\ \sqrt[5]{9\sqrt[5]{9\sqrt[5]{9}}},\ldots$$

   assuming that this limit exists.

   (A) $3^{\frac{1}{11}}$ (B) $3^{\frac{1}{10}}$ (C) $3^{\frac{1}{9}}$ (D) $3^{\frac{1}{8}}$ (E) $3^{\frac{1}{7}}$ (F) $3^{\frac{1}{6}}$ (G) $3^{\frac{1}{5}}$ (H) $3^{\frac{1}{4}}$ (I) $3^{\frac{1}{3}}$ (J) $3^{\frac{1}{2}}$

3. Evaluate the sum $s = 1 + 0.7 + 0.49 + 0.343 + \cdots$.

   (A) $\frac{16}{7}$ (B) $\frac{15}{7}$ (C) $\frac{14}{5}$ (D) $\frac{13}{5}$ (E) $\frac{12}{5}$ (F) $\frac{11}{5}$ (G) $\frac{14}{3}$ (H) $\frac{12}{3}$ (I) $\frac{11}{3}$ (J) $\frac{10}{3}$

4. Evaluate the sum of the series $\sum_{n=1}^{\infty} \frac{2}{n^2+4n+3}$.

   (A) $\frac{1}{6}$ (B) $\frac{2}{6}$ (C) $\frac{3}{6}$ (D) $\frac{4}{6}$ (E) $\frac{5}{6}$ (F) 1 (G) $\frac{7}{6}$ (H) $\frac{8}{6}$ (I) $\frac{9}{6}$ (J) Does not exist

5. Evaluate the sum of the series $\sum_{n=1}^{\infty}[0.09\cdot(0.7)^n + 0.49\cdot(0.3)^n]$.

(A) 1 (B) $\frac{1}{2}$ (C) 0.42 (D) 0.21 (E) $\frac{1}{3}$ (F) $\sqrt{2}$ (G) 0.63 (H) $\frac{1}{5}$ (I) $\frac{1}{4}$ (J) Does not exist

6. Consider the series $\sum_{n=1}^{\infty}\frac{3(-1)^{n-1}}{n^2}$. Find the smallest integer n (among the given choices (A)–(J)) such that the n^{th} partial sum s_n satisfies the inequality $|s - s_n| < 0.01$.

(A) 10 (B) 11 (C) 12 (D) 13 (E) 14 (F) 15 (G) 16 (H) 17 (I) 18 (J) 19

7. The series $\sum_{n=1}^{\infty}\left(1+\frac{1}{n}\right)^{-kn^2}$ converges for all values of k such that:

(A) $k<0$ (B) $k=0$ (C) $-1<k<1$ (D) $k>0$ (E) $0\le k<1$

(F) $0\le k<\infty$ (G) $-1\le k\le 0$ (H) $-1<k\le 0$ (I) $-1<k<0$ (J) $-2<k<1$

8. Consider the following two series $\sum_{n=1}^{\infty}\frac{(-1)^n n^9}{(1.01)^n}$ and $\sum_{n=1}^{\infty}\frac{(-1)^n n!}{n^5}$. Which of the following statements regarding the convergence of these series is correct?

(A) AC, AC (B) AC, CC (C) AC, D (D) CC, AC (E) CC, CC

(F) CC, D (G) D, AC (H) D, CC (I) D, D

9. Evaluate the sum $\sum_{n=3}^{\infty}\frac{1}{n\cdot\ln n\cdot\ln(\ln n)}$.

(A) 1 (B) $\frac{3}{2}$ (C) $\frac{4}{3}$ (D) $\frac{5}{4}$ (E) $\frac{6}{5}$ (F) $\frac{7}{6}$ (G) $\frac{8}{7}$ (H) $\frac{9}{8}$ (I) $\frac{10}{9}$ (J) Does not exist

10. Identify the series which is conditionally convergent, but not absolutely convergent.

(A) $\sum_{n=1}^{\infty}(-1)^n\frac{n^2 2^n}{n!}$ (B) $\sum_{n=1}^{\infty}\frac{(-1)^n\arctan n}{n^3}$ (C) $\sum_{n=1}^{\infty}\frac{(-3)^n}{n!}$ (D) $\sum_{n=1}^{\infty}\frac{n^n}{5^{2n+3}}$

(E) $\sum_{n=1}^{\infty}\frac{\cos\left(\frac{n\pi}{6}\right)}{n\sqrt{n}}$ (F) $\sum_{n=2}^{\infty}\frac{(-1)^n}{(\ln n)^n}$ (G) $\sum_{n=2}^{\infty}\frac{(-1)^n}{n\ln n}$ (H) $\sum_{n=1}^{\infty}\frac{(-1)^n}{(\arctan n)^n}$

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